

CLAIMS

I claim:

1 1. A high speed multiplier comprising a folding multiplier configured to fold
2 multiplicands and multipliers where individual ones of said multiplicands and multipliers
3 exceed a folding threshold, said folding multiplier computing a product of said
4 multiplicands and multipliers based on less than all bits comprising said multiplicands
5 and multipliers.

1 2. The high speed multiplier of claim 1, further comprising a conventional multiplier
2 and at least one additional folding multiplier, each of said multipliers being individually,
3 selectably activatable.

1 3. A folding multiplication method for reducing power dissipation when multiplying a
2 multiplicand and multiplier in a computing device, said method comprising the steps of:
3 identifying a folding threshold below which multiplicands and multipliers, when
4 multiplied, cause less power dissipation than that which would be caused in a
5 conventional multiplication;
6 determining whether either of the multiplicand or the multiplier exceed said
7 folding threshold, and establishing a first non-zero scaling factor for the multiplicand if
8 the multiplicand exceeds said folding threshold, and a second non-zero scaling factor
9 for the multiplier if the multiplier exceeds said folding threshold;

10 averaging the multiplicand and multiplier and computing a value equivalent to
11 one-half of the difference of the multiplicand and multiplier;

12 squaring a first operand, said first operand being equal to said average less a
13 fractional portion of said first scaling factor, squaring a second operand, said second
14 operand being equal to said computation value less a fractional portion of said second
15 scaling factor, squaring a third operand, said third operand being equal to said fractional
16 portion of said first scaling factor, and squaring a fourth operand, said fourth operand
17 being equal to said fractional portion of said second scaling factor;

18 multiplying said first scaling factor by said average, said multiplication resulting in
19 a first product, and further multiplying said second scaling factor by said computed
20 value, said further multiplication resulting in a second product; and,

21 summing said squared first operand, said first product and said squared fourth
22 operand, and subtracting from said sum, said squared second operand, said second
23 product and said squared third operand, said subtraction producing a folded product.

1 4. The folding method of claim 3, further comprising performing said squaring of
2 said first operand and said multiplication using a value of zero for said first scaling factor
3 only if said average evaluates equal to or below said folding threshold, and performing
4 said squaring of said second operand and said further multiplication using a value of
5 zero for said second scaling factor only if said computed value evaluates equal to or
6 below said folding threshold.

7 5. A machine readable storage having stored thereon a computer program, said
8 computer program comprising a routine set of instructions for causing the machine to
9 perform the steps of:

10 identifying a folding threshold below which multiplicands and multipliers, when
11 multiplied, cause less power dissipation than that which would be caused in a
12 conventional multiplication;

13 determining whether either of the multiplicand or the multiplier exceed said
14 folding threshold, and establishing a first non-zero scaling factor for the multiplicand if
15 the multiplicand exceeds said folding threshold, and a second non-zero scaling factor
16 for the multiplier if the multiplier exceeds said folding threshold;

17 averaging the multiplicand and multiplier and computing a value equivalent to
18 one-half of the difference of the multiplicand and multiplier;

19 squaring a first operand, said first operand being equal to said average less a
20 fractional portion of said first scaling factor, squaring a second operand, said second
21 operand being equal to said computation value less a fractional portion of said second
22 scaling factor, squaring a third operand, said third operand being equal to said fractional
23 portion of said first scaling factor, and squaring a fourth operand, said fourth operand
24 being equal to said fractional portion of said second scaling factor;

25 multiplying said first scaling factor by said average, said multiplication resulting in
26 a first product, and further multiplying said second scaling factor by said computed
27 value, said further multiplication resulting in a second product; and,
28 summing said squared first operand, said first product and said squared fourth
29 operand, and subtracting from said sum, said squared second operand, said second
30 product and said squared third operand, said subtraction producing a folded product.

1 6. The machine readable storage of claim 5, further comprising performing said
2 squaring of said first operand and said multiplication using a value of zero for said first
3 scaling factor only if said average evaluates equal to or below said folding threshold,
4 and performing said squaring of said second operand and said further multiplication
5 using a value of zero for said second scaling factor only if said computed value
6 evaluates equal to or below said folding threshold.